Excerpt from Steve Magness' blog - The Science of Running

The manipulation of biomechanics to improve RE in distance runners is often a subject of controversy. As mentioned previously, the complexity of efficiency makes discerning the effects on changes in biomechanics on RE a difficult one. This is due to fact that when changing biomechanics it should be expected that a short term reduction in economy would occur due to the fact that new motor programming has to take place and muscle recruitment patterns might change. Therefore, doing short term studies on changes in RE via mechanically manipulations might not be a good idea. However, evidence exists that some mechanical changes may improve RE. The study by Morgen et al. changed stride length using audio and visual feedback that resulted in an optimizing of step length and an improvement in RE (1994). This study points to the idea that mechanical manipulations can improve RE. Lastly, the practical experience of many of the world's best track coaches who focus on manipulation of technique provides evidence from the practical world.

Neuromuscular Efficiency:

In addition to the various components that impact mechanical and metabolic efficiency, neuromuscular characteristics need to be taken into consideration. This efficiency can be broken into two categories, factors which improve the neural signaling and motor programming of the running motion and those that improve the muscle force production itself. Recall how the running movement occurs. Reflexes and motor programs at the brain and spinal level combine that result in the running motion. Although it is often not considered one, running is a skill, just like hitting a baseball or swinging a golf club. Similar to those skills, practice is needed to improve efficiency at the activity. As the movement is practiced the body becomes more efficient by refining the motor program, learning exactly what muscles to recruit, what ones to inhibit, and the exact number of muscle fibers needed. It is through this refinement that the movement becomes better coordination and efficient. Research has demonstrated these claims, consistently showing that repeated practice results in improved muscle fiber recruitment and movement control (Bonacci et al., 2009). A more efficient recruitment pattern decreases RE because of the intricate linking between VO2 and RE.

Neuromuscular efficiency can also be seen through muscle activation studies comparing untrained with moderately or well trained individuals. In a study done comparing cyclists, differences in muscle recruitment were found. Novice cyclists showed greater variability in muscle recruitment between pedals, more variations of recruitment between each individual, more muscle co-activation, and longer muscle activation periods than well trained cyclists (Chapman et al., 2008). These results point to the idea that training can improve neuromuscular characteristics.